IN THE

Supreme Court of the United States

October Term, 1948.

No. 612

LEROY J. LEISHMAN,

Petitioner,

vs.

THE RICHARDS & CONOVER COMPANY,

Respondent.

PETITION FOR REHEARING OF ORDER ON PETITION FOR WRIT OF CERTIORARI.

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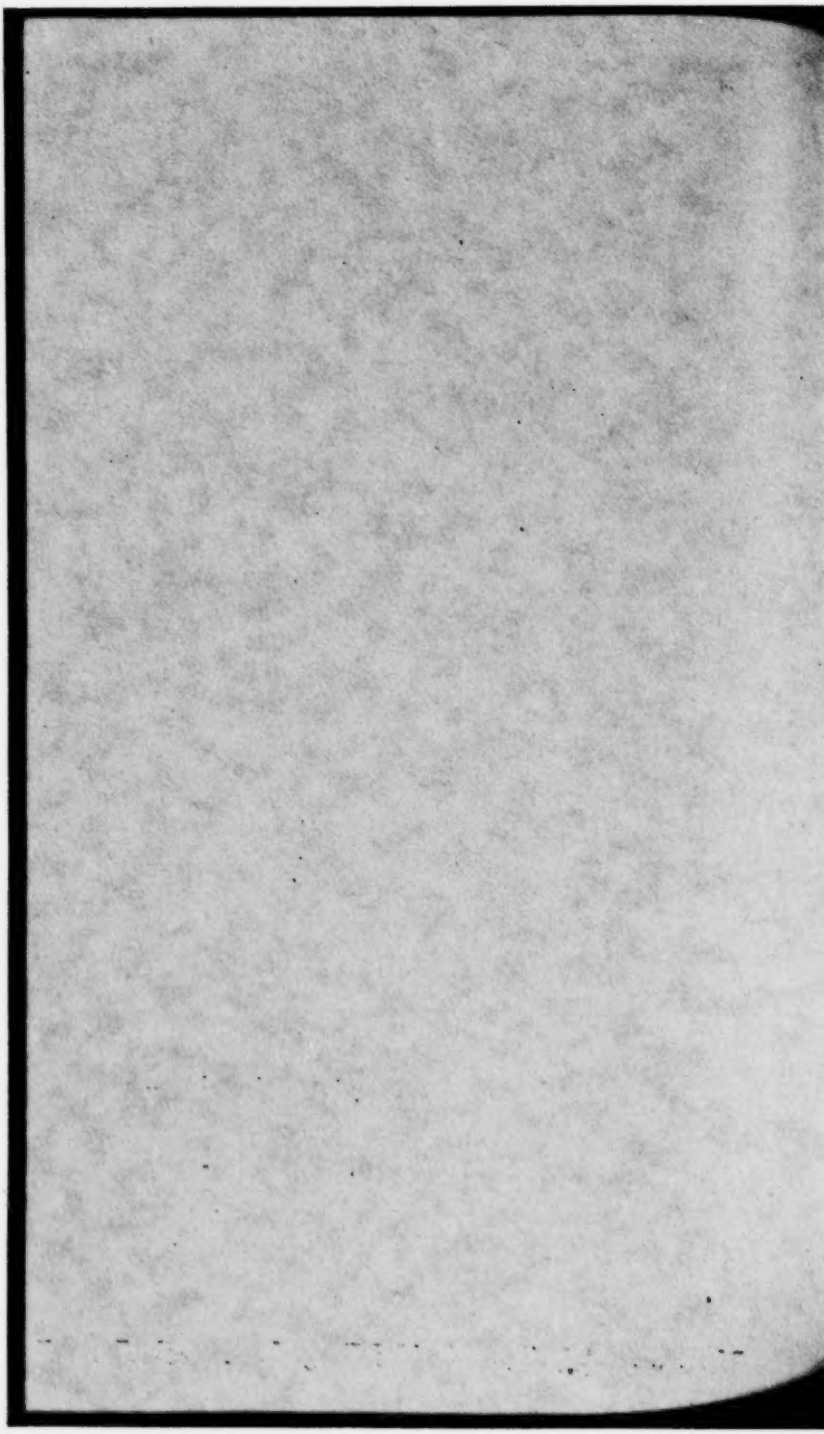

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I.
PETITION.

To the Honorable Supreme Court of the United States:

On the additional grounds hereinafter set forth, petitioner hereby petitions this Honorable Supreme Court for a rehearing of the order denying his petition for a writ of certiorari in the above entitled case.

On April 28, 1949, Mr. Justice Wiley Rutledge extended the time for filing this petition for rehearing to and including May 21, 1949.

II.
ADDITIONAL REASONS RELIED UPON FOR ALLOWANCE OF THE WRIT.

1. Examination and comparison of the appellate court's plurality of decisions on this one appeal[1] reveal that the appellate court's reversal of the lower court was the result of serious errors due to an inadequate and superficial consideration of the subject and to a total disregard of the lower court's findings of fact.

a. The initial hearing of the appeal herein was held on the same day as the hearing in the unrelated case of *Harris et al., doing business as H-C Products Company, v. National Machine Works, Inc., et al.*, 79 USPQ 320. The *Harris* case involved the validity and infringement of a patent to one Gerner. Both petitioner Leishman and Gerner employed means to bring about a **coaxial relationship** between parts—but in different devices, and for totally different and opposite purposes. In the instant case, having to do with push button radio tuners, the coaxial relationship was put to the novel and unorthodox use of **preventing** movement. Gerner, on the other hand, used the **coaxial** relationship for the **opposite** and **conventional** purpose of enabling two parts (the stub shaft and drive shaft of an automobile) to **operate together harmoniously.** The latter use was held to be old, the appellate court saying in its first decision in the instant case (79 USPQ 316 at 320):

"The principle of coaxial relationship and its importance, where it is desired that two parts of a ma-

[1]The first of these three decisions was published in 79 United States Patent Quarterly 316. The second decision is an altered version of the first, and appeared later in 172 F. 2d 365, along with the third decision which was rendered after a rehearing.

chine **operate together harmoniously,** has been within the knowledge, for many years, of ordinary mechanics skilled in their art."

On this premise, the appellate court held that Leishman's conception "would involve the exercise of mere mechanical skill." **But it wasn't Leishman** who used a coaxial relationship "where it is desired that two parts of a machine **operate together harmoniously." It was Gerner,** whose case was heard following Leishman's; and Gerner's device was held to involve invention. Leishman used a coaxial relationship for the opposite, unorthodox and unprecedented purpose of **preventing movement.** Had the appellate court considered the lower court's findings of fact, this confusion between these opposite uses of coaxiality could not have occurred, for the trial court made the following findings on this very point [R. 30]:

"13. The **coaxial relationship** between the axis of the tappet, or adjustable means, and the axis of the rocker **is for the purpose of preventing any rotation whatever** of the adjusted tappet and rocker during the adjusting process. Coaxiality has been used **in the past** for the **opposite** purpose of **permitting parts to move freely** and without binding.

"14. The defendant presented no example of the use of a coaxial relationship that was at all analogous to the use made of this relationship in the combination set forth in the claims of the reissue patent in suit; and defendant's expert, Dr. Spotts, stated on cross-examination **that he knew of no instance in which a coaxial relationship had been used for a similar purpose."** (Emphasis added.)

b. The first decision herein shows that the court was also confused between petitioner's tuner and the prior-art tuner of Marschalk. Of Leishman's tuner, the court said (79 USPQ 316 at 318): "Adjustment is effected by loosening a wing nut on a setscrew mounted on the lever and extending through a recess in the tappet, . . ." **THERE IS NO WING NUT IN LEISHMAN'S TUNER, AND NO RECESS IN HIS TAPPET.** The court's description applies to the **Marschalk device,** over which the court then concluded that Leishman had made no patentable improvement. In the revised version, or second opinion (172 F. 2d 365, 367), which appeared after a rehearing was requested, the court changed the description to read on petitioner's tuner, and the reference to a "wing nut" and "a recess in the tappet" were eliminated.

c. When its first opinion was rendered, the appellate court also confused common spur gears with ratchet wheels, saying (79 USPQ at 319): "Movement of the shaft of the rocker (of the accused device) is communicated by ratchet gears to the shaft upon which the movable condenser plates are mounted." Ratchet wheels are not used to transmit motion from one such wheel to another, but rather to prevent a part from moving in a reverse direction excepting when the pawl is lifted. See cut in Webster's New International Dictionary, Unabridged. This was called to the appellate court's attention in "Appellee's Supplemental Brief in Support of Petition for Rehearing." In the revised, or second, opinion (172 F. 2d 365 at 368), the court changed the original term "ratchet gears" to "spur gears." Such

unfamiliarity with the subject and with mechanical matters in general, shows that the court was ill qualified to brush aside the expert testimony and make its own mathematical analysis of the unwanted movement in the prior art Marschalk tuner, as the court undertook to do in its third opinion, after petitioner had shown at the rehearing that respondent's expert witness (an associate professor of machine design at Northwestern University) had been unable to make such an analysis.

2. In the appellate court's third decision, instead of correcting its original errors and basing its new decision upon the record, the court went outside the record and attempted to justify its original conclusions by means of the aforementioned inept mathematical analysis. This analysis was erroneous because:

a. The analysis had no basis in the record.

b. The court made grievous mistakes in its analytical drawings, and then based its conclusions in large part upon these mistakes. (This particular reason why this Honorable Court should review the appellate court's opinion, was urged in the original petition as reason 1(b) for allowance of the writ. This reason is repeated here only so that it may be viewed in its relation to the other reasons which are here advanced for the first time.)

c. The appellate court's conceptions of "levers" and "lever arms," aside from having no basis in the

expert testimony, are contrary to the principles taught in elementary texts in physics and mechanics for college and high school students, as hereinafter shown in the argument.

3. Had the appellate court given proper consideration to the expert testimony, it would have found excellent evidence of invention in the inability of respondent's expert witness to explain the causes of the prior art difficulties eight years after petitioner had solved them. The folly of Dr. Spott's explanation of the unwanted movement in the Marschalk tuner is readily demonstrated by his proposed drawings, as shown in the argument.

4. In ruling that petitioner's cure for the prior-art difficulty would have been apparent to any mechanic skilled in the art, the appellate court entirely overlooked the practical fact that it was **not** apparent to **any** of the skilled workers and trained engineers who struggled with the problem during the decade from 1928 to 1938.

5. The appellate court's reversal of the trial court on the issue of validity is a serious violation of Rule 52a which provides that findings of fact shall not be disturbed unless they are clearly in error or unsupported by evidence. The seriousness of this violation of Rule 52a is augmented by the fact that its effects are not confined to the instant case, but have a direct bearing upon the ultimate outcome of Ninth Circuit litigation, as will hereinafter be explained.

III.

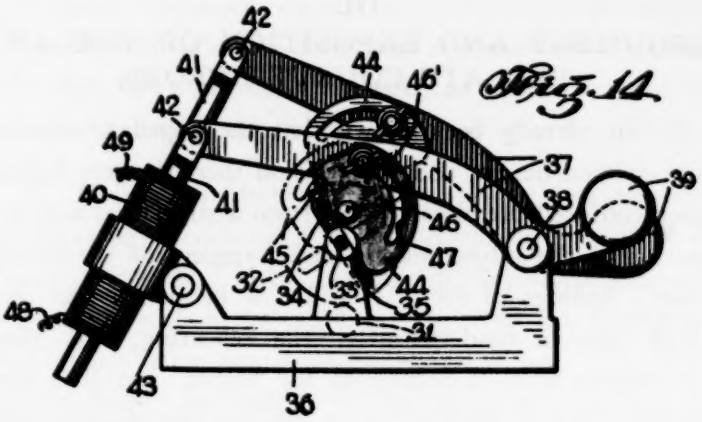
ARGUMENT AND EXPOSITION OF THE APPELLATE COURT'S ERRORS.

It has already been shown that the appellate court's first opinion herein, and the revision thereof, were based upon confused premises arising from a superficial consideration of the subject matter and a neglect of the lower court's findings of fact. It will now be shown that the third opinion, rendered after the rehearing, was also formulated without regard to the record, and that the appellate court resorted to a devious pseudo-scientific analysis to bolster its originally announced conclusions.

An appraisal of the appellate court's last opinion necessarily involves certain allusions to the record and to the purposes behind the combination covered by the claims here at issue. These claims cover the features of the invention that make push-button radio tuners easy to adjust or "set" so that the subsequent operation of the buttons will tune in the desired stations accurately.

1. The Difficulty That Was Effectively Solved by Petitioner's Invention.

The difficulty that needed to be overcome in order to permit easy setting, is well demonstrated in the prior art Marschalk tuner discussed in the opinions sought to be reviewed. Marschalk's patent, No. 2,072,897, appears in the record in Vol. II, pages 415 *et seq.* For the convenience of the court, Fig 14 from the Marschalk patent is reproduced on the following page.



Marschalk's device employs a relatively long rocker 34 (colored green) mounted on a shaft which is operatively connected to the rotatable tuning control of the radio set. Only the end of rocker 34 shows in the figure. This rocker assumes a different tilt, or angular position, according to what station is tuned in. In order automatically to give this rocker the particular tilt required for each favorite station, Marschalk employs a series of tappets, or contacting plates, 44 each mounted on a pivot 46 carried by an operating lever 37. When any lever is depressed, its associated tappet 44 engages the long rocker and turns it to the same angular tilt as the tappet. The same rocker is used for all the tappets.

Before any operating lever and tappet may be used to tune in a given station, the tappet 44 (colored red) must first be adjusted, or set, to the proper angular tilt required for that particular station. Any tappet may be loosened for adjustment purposes by loosening the associated wing-

nut 46'.[2] The next step in the "setting" or adjusting process, is to tune in the desired station carefully by means of the regular manual knob (not shown). This causes the rocker 34, colored green, to assume a definite angular position. After the rocker has thus been accurately positioned, the operating lever 37 is pressed down so that the loosened tappet 44 engages the rocker, causing the tappet to assume the same angular position, or tilt, as the rocker. But if the rocker is near either of its extreme tilted positions, such as those shown respectively in full lines and dotted lines in the figure, a peculiar thing occurs: **The rocker and tappet both immediately flip around or "creep" away from the tilted position and tend to become horizontal.** Great care must accordingly be used in setting Marschalk's tappet. Sufficient pressure must be exerted on the operating lever to assure that the loosened tappet or adjustable means 44 will assume the exact angular position of the rocker, yet a slight excess pressure will immediately cause these parts to "creep" and destroy the careful setting of the rocker. A variation of a small fraction of one degree will destroy the accuracy of the adjustment. [R. 61-62.] If the operator is fortunate not to have disturbed the setting, the wing-nut 46' may be tightened and the tappet thus clamped in its proper adjusted position.

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[2]The first opinion (79 USPQ 316, at 318) described this as the method of loosening petitioner Leishman's tappet, but the method is peculiar to Marschalk's device, Leishman's structure and method being considerably different.

It will be obvious that any subsequent operation of the lever will cause the tappet to engage the rocker and turn it to the angular position for which the tappet was adjusted. But if the tappet has not been accurately adjusted, or if there was the slightest movement during the adjusting process, the subsequent operation of the lever will not tune in the station properly.

Before a satisfactory adjustable tappet tuner could be produced, it was necessary that the setting difficulty be solved and the creeping eliminated without introducing other undue complexities. Various workers in the art endeavored to provide an acceptable adjustable tappet tuner from 1928 until the issuance of petitioner's patent in 1938. Their devices either required many extra parts or involved tedious methods of adjustment.

Petitioner eliminated the creeping movement by the mere shape and relationship of the rocker and tappet, which were mutually arranged so that one could nest within the other in the fully engaged position in order that their axes of rotation might become coincident, or **coaxial.** The coaxial arrangement of the tappet and rocker are graphically illustrated in the drawings on page 11 hereof. For the sake of simplicity, the operating lever and the means for clamping the tappet in adjusted position are not shown in these figures. The coaxial relationship was shown in Fig. 2 of the patent in suit [R. 261] and described in the specification on page 264, lines 30 to 34.[3]

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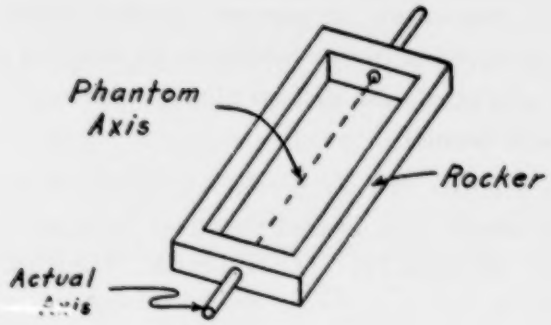
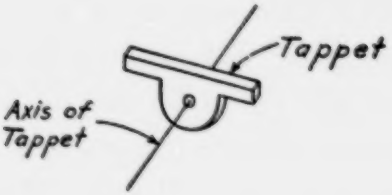
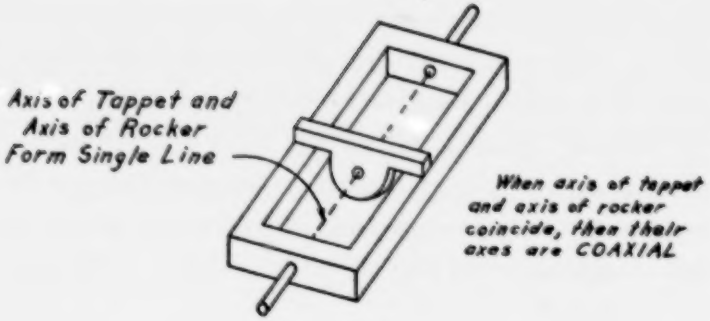
[3]This structure was immediately adopted on a large scale, and approximately eight million such tuners were manufactured prior to April, 1942, when the manufacture of commercial radio receivers was stopped by federal order to facilitate concentration on the defense program. See finding of fact 25, quoted on page 36 hereof.


Phantom
Axis
Rocker
Actual
Axis


Tappet
Axis of
Tappet


Axis of Tappet and
Axis of Rocker
Form Single Line
When axis of tappet
and axis of rocker
coincide, then their
axes are COAXIAL

2. Nature of the Appellate Court's Errors.

A proper understanding of the fact that petitioner used the coaxial relationship to **prevent** rotation, shows the error of the appellate court's holding in its first two opinions that petitioner's use of coaxiality involved only mechanical skill because

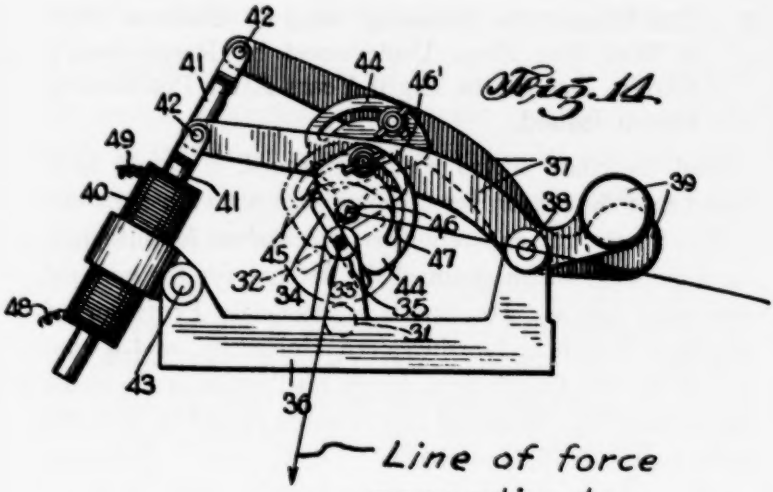
> "The principle of coaxial relationship and its importance, **where it is desired that two parts of a machine OPERATE TOGETHER HARMONIOUSLY,** has been within the knowledge, for many years, of ordinary mechanics skilled in their art." (Emphasis added.)

In its third opinion, rendered after the rehearing, the appellate court did a right-about-face and sought to show that the **opposite** use—the **prevention** of movement in such a device—might come within the skill of a mechanic. This final opinion was also rendered without regard to the record and the findings. It contains erroneous statements about the testimony of respondent's expert, Dr. Spotts. It also indicates that the court was oblivious to most of the efforts made between 1928 and 1938 to solve the creeping problem, despite the lower court's findings on this matter. And the court's alleged analysis of the problem is foreign to anything in the record, as well as full of serious errors that render it valueless as the basis for an opinion.

3. The Reason for Creeping Was so Obscure That It Was Not Even Understood by Respondent's Expert, Dr. Spotts, Eight Years After Petitioner's Patent Issued.

Had the court stayed with the record, it would have found that the reason for creeping was not even apparent to Dr. Spotts, the expert witness for Galvin Manufacturing Company, which assumed the defense for the nominal defendant herein. Dr. Spotts is Associate Professor of Machine Design at Northwestern University, and a consultant for the Galvin firm, where his "duties are to assist the engineering, designing and research departments in the development of their products." [R. 168-169.] Respondent's expert was thus far more than a mere mechanic skilled in the art, and yet the cause of creeping was clearly not apparent to him at the time of the trial in 1946—eight years after Leishman's patent issued. Dr. Spotts' testimony was given in connection with the Marschalk tuner. To make it easy to follow his statements, another reproduction of Marschalk's Fig. 14 is provided on page 14 hereof, where additional lines have been added in accordance with Dr. Spotts' instructions. Dr. Spotts testified as follows [R. 213]:

> "A. The direction of the force that will cause creeping can be found in the following manner: Draw a straight line from pivot 38 to pivot 46. [Such a line has been added to the figure.] Then draw another line at right angles to that line through pivot 46. [This line has also been inserted.] **The force will lie along that perpendicular line.** If it falls **to the left** of pivot 33 then the rotation of the rocker will be **counter clockwise.** If the perpendicular line on the other one falls to the **right** of pivot 33, then there will be **clockwise motion.**" (Emphasis added.)



It will be seen, however, that the said line of force falls neither to the right nor to the left of the pivot 33, but exactly through the center of the pivot. According to Dr. Spotts' theory, there should thus be **no** rotation in the Marschalk device. But the appellate court recognized that there **is** rotation. If the right side of the **rocker** is **up,** there will be clockwise rotation; and if the **left** side of the rocker is **up,** there will be counter-clockwise rotation.

Regarding the foregoing testimony of Dr. Spotts, the appellate court's rehearing opinion incorrectly states [R. 581, bottom of page]:

> "It is obvious that when the expert so testified he was talking about a force from pin A traveling along a straight line. In Marschalk's device, pin A travels in an arc."

This is another of the appellate court's unconsidered conclusions. The foregoing testimony of Dr. Spotts even refers to Marschalk's pivots 33, 38 and 46. It was thus Marschalk's device that Dr. Spotts was talking about, and he was explaining how he accounted for creeping in this particular device.

The court's statement continued, in further error:

> ". . . But the fact that pin A moves in an arc to the right of vertical line XY is one cause of creeping in Marschalk's device."

The verical line XY appears only in the court's drawing, The tappet pivot pin 46 is neither to the right nor left of the line of force to which Dr. Spotts referred. If it were to the right of **any** line, it would **always** be to the right of such line, and according to Dr. Spotts' theory the rotation would consequently always be **clockwise**. But such is not the case. If the **left** end of the rocker is up, the rotation is **counter clockwise,** although such angular position of the rocker in no way moves the lateral position of the tappet pivot.

The next sentence in the court's opinion is as follows:

> ". . . The expert did not testify that it was the sole cause of creeping."

Yes, he did. On page 206, he testified:

> ". . . If you make a drawing where you can show it exactly, you will see that the force is

> directed at a slight angle over the pivot of the tappet, an angle which carries it not through the center of the rocker but a little bit to one side, and **this sidewise application of the force off the center of the rocker is THE reason why the rocker moves."** (Emphasis added.)

Such a drawing is here provided, and we see instead that Dr. Spotts' line of force passes exactly through the **center** of the rocker. Manifestly, Dr. Spotts did not know what makes the rocker move during the adjusting process when the tappet and rocker are not coaxial. His testimony demonstrated that the real reason for creeping is very obscure and that more than mechanical skill was required in arriving at Leishman's simple cure.

What better demonstration could there be that petitioner's solution was beyond mechanical skill than the inability of respondent's own expert to explain it? The expert's unusual qualifications make the evidence all the more convincing. Before becoming Associate Professor of Machine Design at Northwestern University and a consultant for Galvin Manufacturing Company, he had taught at the University of Michigan and at Johns Hopkins University [R. 168]. Moreover, the thirteen month interval between the filing of the complaint and the beginning of the trial gave respondent every opportunity to think of valid reasons why petitioner's solution would have been obvious—if there were any such reasons.

But the appellate court overlooked the significance of Dr. Spotts' testimony and was apparently oblivious to the fact that no simple solution of the creeping problem was provided by any of the experimenters of record, other than Leishman, who tackled the problem during the decade from 1928 to 1938. Instead of heeding the trial court's findings along this line, the appellate court based its final opinion solely upon a pseudo-scientific analysis of its own.

4. The Appellate Court's Drawing Contain Serious Errors That Misled the Court.

The appellate court's analytical drawings [R. 578] are reproduced on page 21 hereof, together with two additional figures which petitioner has added for explanatory purposes. Figs. 1 and 2 are by the court; Figs. 3 and 4 by petitioner. The triangle J in Figs. 1 and 2 is supposed to represent the Marschalk tappet in contact with the rocker I. However, there is not much resemblance between this tappet and that of Marschalk. Fig. 2 illustrates the tappet and rocker when the latter is in a horizontal position, and Fig. 1 is intended to show the position of these parts when the rocker is tilted. The court uses Figs. 1 and 2 to explain how it thinks a mechanic skilled in the art would analyze the creeping problem and readily arrive at petitioner's solution.

Drawings intended to show different operative positions of parts of an instrument, can obviously be of no

dependable analytical value unless they are accurate. The drawings must show how the parts would actually appear in the positions to be studied. Inasmuch as the court concludes that a skilled mechanic would attach great significance to the relative positions of the pivots A and D as shown in the two figures and that such mechanic would attribute the cause of creeping to the unequal lengths of certain lines, it is very important to know whether the drawings are correct. To make this easy to determine, petitioner has provided a movable transparent plastic tappet constructed exactly like the tappet shown in the appellate court's Fig. 2. To prevent this tappet from being mislaid or lost, it is attached to one end of a cord, and the other end of this cord is affixed to the left edge of the page on which the appellate court's drawings are reproduced.

When this transparent tappet is superimposed on the tappet J of Fig. 2, it will be noted that the hole in the plastic tappet is exactly over the pivot A of the tappet in the figure. This should also be true of the tappet in Fig. 1 if the drawings are to be of any value. But if the pivot hole in the plastic tappet is placed over the pivot A in Fig. 1, **it will be seen that the lower edge of the plastic tappet reaches only half way to the edge of the tappet in the figure.** If the lower edge of the plastic tappet is placed in contact with the rocker in Fig. 1 and the pivot hole positioned very slightly to the right of line X-Y, as in Fig. 2, it will be seen that neither of the other edges of the tappet coincide and

that **the court has placed its pivot about twice as far from the lower edge of the tappet as it ought to be.** Yet the court bases its opinion upon the fact that the pivots A and D in Fig. 1 are so much further apart than in Fig. 2, a condition that prevails only because the court improperly drew them that way.

Says the court [R. 579, bottom of page]:

> "When the rocker and the tappet are positioned as in figure 1, pin A is a greater distance above the axis of the rocker shafts and a greater distance to the right of the vertical line XY than when the rocker and tappet are positioned as in figure 2."

At the bottom of page 580 of the record, the court concludes:

> "Since the more the rocker is tilted the greater becomes the non-coaxiality between the axis of the rocker shafts and pin A and the greater becomes the tendency of the rocker to creep, and since, when the pin A approaches substantial coaxiality with the rocker shafts, creeping disappears, it is obvious that the problem can be solved by effecting substantial coaxiality between pin A and the axis of the rocker shafts, when the tappet is in full engagement with the rocker."

The illogic of this is at once apparent when the tilted position, purportedly illustrated in the court's Fig. 1, is properly drawn. By checking with the plastic tappet, it will be seen that the parts are properly drawn in

Fig. 3, prepared by petitioner. The tilt of the rocker is exactly the same in petitioner's Fig. 3 as in the appellate court's Fig. 1. It will be noted that the separation between the pivots A and D in Fig. 3 is not perceptibly greater than in Fig. 2. The difference is so small that it must be determined geometrically by laying the figure out on a very large scale, or by calculating the difference by trigonometry. It is of the order of 5%. The actual distance between pivots A and D in Fig. 2 is 7/32, or .2187, of an inch. Five per cent of this, as simple arithmetic will verify, is only .0109—or almost exactly 1/100 of an inch. The pivots would actually be, then, only 1/100 of an inch further apart when the rocker is tilted to the particular angle shown, than they are in the horizontal position. Even in the most extreme angular positions to which the rockers in these tuners may be turned, the difference in the separation of the axes is only a few hundredths of an inch.

The appellate court, however, shows a separation of 13/32 of an inch between the pivots in its Fig. 1. Reduced to decimals, this is .4062. This separation of .4062, pictured in Fig. 1, is 85% more than the separation of .2187 shown in Fig. 2, whereas the **actual** increase in separation, as verified by Fig. 3, is only 5%. In representing the increase as 85% instead of 5%, the appellate court has indicated the increase to be 17 **times greater than it is**. The court has thus made an error of 1700%. This tremendous error is disastrous for petitioner, because the appellate court's conclusion

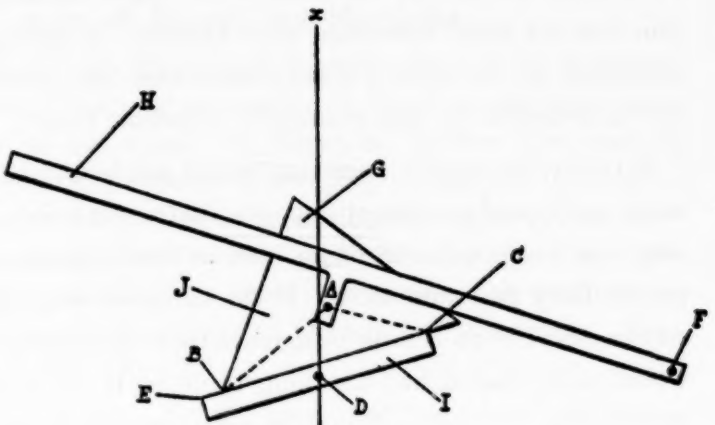


FIG.-1

Fig. 4

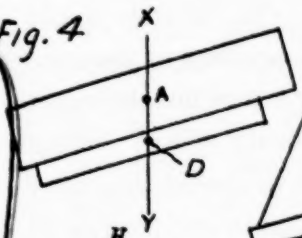
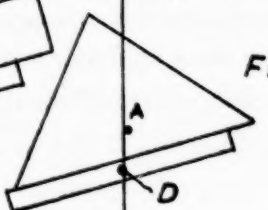


Fig. 3



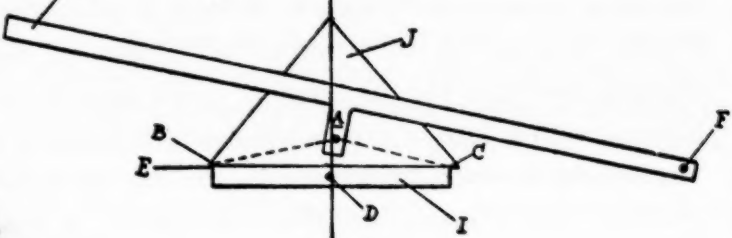


FIG.-2

that petitioner's cure for creeping would be obvious to a mere mechanic, was based upon the court's assumption that its inept drawings were correct. A judicial procedure of this type is totally untenable, and should not be tolerated by this Honorable Supreme Court.

Actually, the skilled mechanic would not be thinking about axes, and petitioner submits that a variation of only one one-hundredth of an inch in their separation would likely pass unnoticed. If the variation **were** observed, there is no reason to assume that the mechanic would think that it had anything to do with the cause of creeping. If such a thing did occur to him, it does not follow that he would surmise the difficulty might be eliminated by some specific arrangement of the axes. Should his investigations lead along that line, he might try numerous possible arrangements before hitting upon a coaxial relationship. If the mechanic were alert enough to notice the small variation in the position of the axes, attach significance to it, and then conduct experiments leading to a successful solution of the creeping problem, the "mechanic" would have to be inspired with a flash of genius. His contributions in a virgin field would certainly rise to the dignity of invention. Had the appellate court considered the trial court's findings, it would have learned that the ten-year investigations of other experimenters led them along entirely different paths.

5. The Appellate Court's Conception of "Leverage" and "Levers" Is Contrary to Elementary Principles of Physics and Mechanics.

There are many other serious errors in the appellate court's analysis of creeping. Despite what the court had to say about the distances between the axes, it attributed the **cause** of creeping to unequal "leverage," and to "levers" of unequal lengths. The court's conception of these terms, when they apply to the application of forces, is highly erroneous and contrary to elementary teachings of physics and mechanics. Says the court [R. 580]:

> ". . . the distance from the axis of the rocker shafts to the point on edge C of the upper face of the rocker where the base of the tappet intersects such edge, referred to hereinafter as point P, is greater than the distance from such axis to point B. Hence, the **lever** from point P to the axis of the rocker shafts is longer than the **lever** from point B to such axis, and the **lever** from point B to pin A is longer than the **lever** from point O to pin A. As a result, when force is exerted by downward pressure of the lever H through the tappet upon the face of the rocker, the downward force at point O has the advantage of greater **leverage** than the downward force at point B, and the resisting force of the rocker at point B has the advantage of greater **leverage** than the resisting force of the rocker at point O."

The court's errors with respect to "levers" and "leverage" are among the first which students are cautioned against in elementary courses in mechanics and physics. The lever arms that determine the effect of

forces do not extend from the axis to the point where the force acts, as the court has drawn them. The court's errors in this respect are easily shown by referring to elementary text books. The folding insert between pages 26 and 27 hereof contains a reproduction of the pertinent pages from two such texts. The page reproduced at the left is from "Mechanics" by John W. Breneman, C. E., Associate Professor of Engineering Mechanics, prepared under the direction of the Division of Engineering Extension of the Pennsylvania State College and published in 1941 by McGraw-Hill Book Company, Inc. of New York and London. The text shows that the laws applying to lever arms are universal, the same laws applying to straight levers and even to bent levers. Regarding the latter, the text says: ". . . great care must be taken to determine the true length of the lever arms. In **every** case the **true length** of the lever arms will be the **PERPENDICULAR distance** between the fulcrum and the line of the force or weight." (Emphasis added.) Fig. 61 lucidly illustrates exactly what that means, and the text says, "Thus, in Fig. 61, L is the lever arm for the acting force P and L′ is the arm for the reacting weight W." These lever arms do not extend from the axis or fulcrum to the point where the force acts, as the Court of Appeals for the Tenth Circuit drew them in Figs. 1 and 2 of its final opinion, but **always** at **right angles** from the **line** of force to the fulcrum or pivot. If Fig. 61 had been drawn according to the appellate court's theories, the lever arm L′ would have been drawn from the axis or fulcrum to the pin where the weight W is suspended, and the lever arm L would extend from the fulcrum to the

point where the force P is applied. The appellate court's error is thus the very error which the author expected of new students and which the text and Fig. 61 were prepared to guard against.

The printed page that is reproduced at the right of the one just discussed, is from "New Practical Physics," long used as a text in the high schools of the Los Angeles school system. This text was published in 1929 by The Macmillan Company, of New York, and was written by Newton Henry Black, Assistant Professor of Education at Harvard University, and Harvey Nathaniel Davis, President of Stevens Institute and formerly Professor of Mechanical Engineering of Harvard University. Here again the moment arms, or lever arms, are shown in the portions marked to be "the **perpendicular** distance of its [the force's] line of action from the fulcrum"; and the turning effect, or "moment," of a force is "the product of a force and **its perpendicular distance from the fulcrum.**" Thus, in Fig. 20, the moment, or lever arm, of the force D is **not** the distance from the pivot F to the point A where the force is applied, as the appellate court's theory would have it, but rather the line from D to F, which is at right angles, or **perpendicular,** to the line of the force.

That these lever arms, or moment arms, must extend **perpendicularly** from the line of force to the fulcrum is further shown by the definitions of pertinent terms in Webster's New International Dictionary. Thus, **moment** is defined as "8. Mech. Tendency, or measure of tendency, to produce motion, esp. about a point or axis. It is measured in general by the product of a

mass, force, velocity, or the like, into a **perpendicular distance from or to the point** or axis." Also, **moment of a force is defined as** "Mech. a with respect to a point, the product of the magnitude of the vector and **the perpendicular distance from the point to the line of direction.**"

The appellate court's conception of a physical lever as the true measurement of the distance at which a force acts, thus has no basis in mechanics or physics, and the court does not claim that there was any such analysis in the record.

The record does contain, however, two models which prove there is no merit in the theory that creeping in Marschalk's device is caused by the fact that the pivot of the tappet in the court's drawing is to the right of a vertical line, or by the unequal distances from the rocker pivot D to the two points B and C in the court's drawings, to which the court attached significance. These models are illustrated in Fig. 4, drawn on the left of the reproduction of the court's drawings on page 21 hereof. The rocker shown is Plaintiff's Physical Exhibit 26-b and the tappet is Plaintiff's Physical Exhibit 26-a. It will be noted here that the tappet overlaps both ends of the rocker. The pivot A of the tappet moves exactly on the vertical line; and the distance from the rocker pivot D to the far points of contact with the tappet, are exactly equal. **Operation of these exhibits shows that creeping from extreme tilted positions nevertheless occurs.**

of these effects equal to the turning effect of the upward pull, or effort, E (Fig. 19). That is,

$$W_1 \times BF + W_2 \times AF = E \times CF$$

where the distances CF, BF, and AF are measured perpendicularly to the lines of action of the forces.

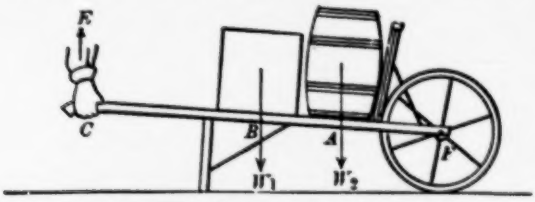


Fig. 19. Wheelbarrow with two weights.

In general, then, we see that we can balance the turning effect of two or more weights by multiplying each weight by the perpendicular distance of its line of action from the fulcrum, and by making the sum of these products equal to the product of the effort by the perpendicular distance of its line of action from the fulcrum.

21. Principle of moments. It has been seen that the turning effect of a force depends on two factors — the amount of the *force* and the *distance* of its line of action from the fulcrum. **The product of a force and its perpendicular distance from the fulcrum is called the moment of the force.**

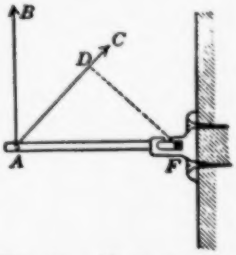


Fig. 20. Moment of a force equals force times its perpendicular distance from fulcrum.

FOR EXAMPLE, let AF (Fig. 20) be a rigid bar which can rotate about F. The moment of the force B applied at A is equal to B times FA; and the moment of force C is equal to C times FD. If B equals C, which is the greater moment?

In general, for a lever to be in equilibrium, *the sum of the moments of the forces tending to turn it in one direction (clockwise) must equal the sum of the moments of the forces tending to turn it in the opposite direction (counterclockwise).*

22. Force at the fulcrum. In the case of the man with the shovel (Fig. 16), we have called his left hand the fulcrum. But it is quite as evident that this hand must exert a force — in this case, a downward push — as that the other hand must pull up.

is placed between the fulcrum and the force, as in Fig. 59, it is known as a lever of the second class. Again, if the force P is placed between the fulcrum and the weight, as in Fig. 60, there results a lever of the third class. The relation between force, weight, force arm, and weight arm, holds true for each class of levers, that is, in every case $PL = WL'$.

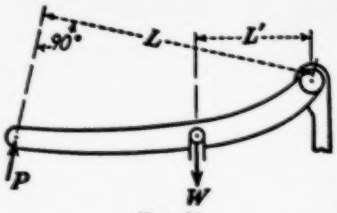


Fig. 61.

The laws that govern the straight lever also apply to the bent lever. In the case of the bent lever, however, great care must be taken to determine the true length of the lever arms. In every case the true length of the arms will be the perpendicular distance between the fulcrum and the direction line of the force or weight. Thus, in Fig. 61, L is the lever arm for the acting force P and L' is the arm for the reacting weight W.

In this figure, if $L = 30$ in., $L' = 8$ in., and $P = 60$ lb., then to find the weight that can be raised,

$$PL = WL'$$

or

$$60 \times 30 = W \times 8$$

$$W = 225 \text{ lb. } \textit{Answer}$$

A simple machine which is based on the lever principle is called the **wheel and axle.** By wrapping ropes around two different sized drums of radii R and r (Fig. 62) we find that the pull P necessary to raise the weight W can be determined. The drums are fastened together on a shaft O so that the center of the shaft becomes the fulcrum, or axis of rotation. Then, by the principle of moments, the moment of the pull PR equals the moment of the weight Wr, or

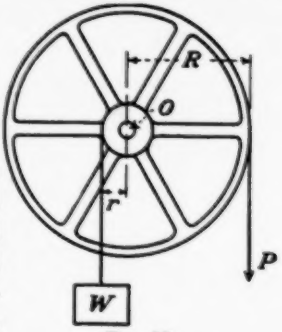


Fig. 62.

$$PR = Wr$$

In the above figure, let $W = \frac{1}{2}$ ton; $r = 3$ in.; and $R = 18$ in. What pull P is required to lift the weight?

$$\tfrac{1}{2} \text{ ton} = \tfrac{1}{2} \times 2000 \text{ lb.} = 1000 \text{ lb.}$$

6. In Reversing the Lower Court, the Court of Appeals Disregarded the Record and the Findings of Fact.

Perhaps the appellate court's greatest error was in its **method** of deciding the appeal. Even if the court, in retrospect, had been able to produce a correct analysis of the causes of creeping, such belated analysis would not prove that a cure would have been apparent to a mechanic unfamiliar with Leishman's teachings. Instead of going outside the record into unfamiliar branches of scientific analysis in order to decide artificially what a skilled mechanic **might** do, the court should have considered the evidence and the trial court's findings as to what the skilled mechanics actually **did** do—unless, perchance, these findings were clearly in error.

But the appellate court did not say they were in error; it apparently overlooked them entirely.[4]

Let us look at some of the undisputed facts as found by the trial court.

The following findings were partcularly pertinent in this regard:

> "18. There had been a demand in the radio industry for many years for a satisfactory automatic

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[4]The importance of a trial court's findings in this respect was heavily stressed by this Honorable Supreme Court in its most recent patent case—*Graver Tank & Mfg. Co., Inc. v. Linde Air Products Co.*, 69 S. Ct. 535, 537, 538; 50 USPQ 452.

tuner; and numerous inventors in the United States and foreign countries sought to satisfy this demand by devices described in patent applications dating as far back as 1924. [R. 30-31.]

"19. Schaefer, Exhibit 20, Marschalk, Exhibit 18, Lane and Mackey, Exhibit 22, and Soffietti, Exhibit 21, in Italy all tried to produce acceptable tuners using an adjustable tappet, but their tuners were all either more complex or much harder to adjust than plaintiff's simple structure." [R. 31.]

Manifestly, plaintiff's simple solution of the problems of adjustable tappet tuners was **not** apparent to skilled mechanics and engineers who actually tackled the problem. The appellate court's unwarranted speculations are thus at variance with the practical facts.

7. The Findings of the Trial Court Were Supported by an Abundance of Evidence.

The trial court's findings of fact were well supported by abundant evidence. Regarding the Marschalk device mentioned in Finding 19, the appellate court's own opinion leaves no doubt that it provided no answer to the problem of creeping. Yet Marschalk's patent [R. 415 *et seq.*] shows that he was far more than a mere mechanic. But the difficulties baffled still other mechanics both before and after Marschalk. These difficulties were naturally encountered by every experimenter who undertook to position a rotatable control by means of adjustable tappets.

In other arts, **fixed** tappets had long been used to turn rockers to exact angular positions.[5] But in these other arts, the required angular position was always the same, and the manufacturer was therefore able to form the tappet at the required angle and make it an integral part of the operating member. In the radio art, however, the large number of broadcasting stations requires hundreds of different tappet positions, and the tappets consequently must be adjustable so that they may be set for the favorite stations of each individual purchaser. The **fixed** tappets of the prior art were naturally brought into direct contact with the rotatable member. When inventors tried to use **adjustable** tappets in order to adapt the tappet idea to the requirements of automatic tuning, it was likewise natural to attempt to apply these directly to the rotatable member. The Marschalk device, however, shows what all the experimenters ran into when they tried

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[5]Before the days of electric clocks, fixed tappets were used in electrically controlled devices to re-set a number of clocks every hour by means of an impulse from a central source. Such an arrangement is shown in Fig. 1 of Kettell's patent [R. 283] where the tappet E engages the rocker D attached to the hour hand. This tappet was an integral part of the lever, because it did not need to be adjusted to bring the minute hand to predetermined different positions. The required position was always the same. The minute hand had to be brought exactly to XII.

Fixed tappets were also used in cash registers, as shown in the Woodbridge patent [R. 297] and the patent to Miller [R. 397]. In such cash register devices, it was required that a rocker be turned to any one of ten positions, representing the digits from 1 to 9 and zero. Woodbridge used a different lever c^1 for each position, but each lever had a tappet c^3 formed on the inner end at a different angle for moving the rocker d to respectively different angular positions.

the direct approach. The creeping difficulty thus faced experimenters long before Marschalk, whose mechanism is significant only because it exhibits the problem in the raw—minus any of the previous or later attempts to solve it.

The first inventor mentioned in Finding 19, *supra,* was Schaefer. He was probably the first experimenter to try to eliminate creeping. His patent No. 1,906,106, will be found in Vol. II of the record, beginning on page 355. It will be noted that his patent application was filed in 1928. The Zenith Radio Corporation used Schaefer's mechanism in some of its sets somewhere between 1928 and 1930 [R. Vol. I, p. 66]. Regarding this early attempt to eliminate creeping, respondent's expert, Dr. Spotts, gave the following testimony in response to the questions of respondent's attorney, Mr. Mueller [R. 205-206]:

> "Q. (By Mr. Mueller): Having the commercial tuner of Zenith available which was on the market for a period of one or two years in the radio industry and having the Schaefer patent available which has been issued since 1933, in that commercial device in the Schaefer patent, do you find a consideration of the problem of creeping in the tuner? A. The drawings and device are both made so there can be no creep.
>
> Q. In other words, that designer did recognize creepage and he found a solution to prevent creepage. Is that correct? A. That is the conclusion I would draw.
>
> Q. That is, creepage is prevented in Schaefer? A. Yes, sir."

Schaefer eliminated creepage by eliminating the rocker and substituting ten other movable parts requiring 8 guides. This made a total of 18 extra parts.[6]

In view of its holding that petitioner's solution of the creeping problem would be obvious to a mechanic skilled in the art, the appellate court makes a rather amazing reference to the Schaefer patent. Said the court [R. 582]:

> "* * * Indeed, he [Dr. Spotts] testified that where the rocker is mounted on a rotatable shaft, rather than as in the prior art patent to Schaefer No. 1906106[1], substantial coaxiality between the axis shafts and pin A would be necessary to avoid creeping."

Its footnote 1 to which the court here refers, reads as follows:

> "[1]Schaefer, instead of using rockers, employed pairs of vertically disposed, reciprocal racks, which moved in guides by means of levers and tappets."

Although Dr. Spotts was not able to analyze the causes of creeping, he was nevertheless familiar with Leishman's cure and he therefore knew that when a rocker is used, "substantial coaxiality between the axis shafts and pin A would be necessary to avoid creeping." But manifestly Schaefer or the other Zenith engineers did not know that creeping could be cured in so simple a manner, or they would not have used the 18 extra parts.

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[6]These extra parts in Schaefer's tuner are enumerated on the folding insert at the back of this petition, where Fig. 3 from Schaefer's patent is reproduced.

In this regard, Leishman on August 27, 1937, wrote the Patent Office during the prosecution of his original patent application:

> ". . . no engineer would use eighteen interrelated parts if ordinary engineering skill would make it obvious that one part would do the work. Furthermore, thousands of Schaefer's devices were manufactured and widely used, and engineers were employed to simplify the construction. This is additional evidence that applicant's improvement is an invention entitled to protection within the scope of the claims." [Dft's. Physical Exhibit OO, p. 14.]

The Patent Office thought so too, for it granted Leishman's patent. But this necessary corollary escaped the Court of Appeals.

The third, fourth and fifth inventors considered in Finding 19 were not even mentioned by the appellate court.

The third and fourth were Lane and Mackey. Their patent application No. 177,163 was filed on November 29, 1937 [R. 68], while petitioner's simple solution of their problem was still locked within the files of the Patent Office.[7] The pertinent drawings from their application are in the record as Plaintiff's Exhibit 22 [R. 475], and one of the figures is reproduced at the lower right of the folding insert at the back of this petition.

Lane and Mackey have a rocker 11-12-13 (colored green in the figure) and a tappet 19-20 (colored red). To avoid creeping, these inventors go to great extremes. It will be observed that their tappet is never freely pivoted

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[7]The heading to the first page of the specification of the reissue patent here in suit explains that the original patent issued on February 15, 1938, and that it was a division of an application filed on December 15, 1934.

and that it can be rotated only by the worm 46, which has threads that fit between the teeth 49 that are formed on the periphery of the tappet.

To adjust Lane and Mackey's tuner, one must first press the button 30 inwardly until the tappet, shown in red, engages the rocker, colored green. This causes the rocker to turn until it assumes the same angular position as the tappet, because the tappet is always locked against free rotation by the threads of the worm 46 that mesh with the teeth around the tappet. The end of a screw driver is then inserted into the screw-head 51, which is attached to the worm 46. When the screw driver is turned, the worm 46 is rotated, causing the tappet to turn the distance from one tooth to another every time the worm makes a complete revolution. If this is done while the tappet is in engagement with the rocker, the rocker will, of course, turn with the tappet. Consequently, by constantly turning the screw driver, the tappet and rocker may be slowly rotated until the desired station is tuned in, and the tappet will then be properly adjusted. Whenever this tappet is again pressed into engagement with the rocker, the latter will assume the same angular position as the adjusted tappet, and the station for which it was adjusted will again be tuned in.

Inasmuch as Lane and Mackey's tappet is never free to turn, the difficulties exhibited in Marschalk's tuner are avoided. But the adjustment of Lane and Mackey's tappet is manifestly a slow and laborious process. Petitioner's simple solution was clearly not apparent to these inventors.

The fifth inventor mentioned in Finding of Fact 19, was Soffietti. His original application was filed in Luxembourg on January 25, 1938 [R. 463], less than a month

before the issuance of Leishman's original patent, and ten years after Schaefer filed his application.

Soffietti's patent discloses another crude and complicated solution of the creeping problem. His Fig. 6 appears in the upper right corner of the folding insert at the back of this petition.

Soffietti's rocker has been colored green, and it will be noted that he uses two different tappets (colored red), **each** of which has to be independently adjusted in accordance with the angular position of the rocker. The creeping difficulty exhibited in Marschalk's tuner has been avoided in Soffietti's device, but his mechanism has so many other setting difficulties that his over-all improvement is slight. Five separate steps are required to set the tappets. As can be seen in Fig. 1 of Soffietti's patent [R. 459], his tappets 6′ and 6″ are screws. The distance that each one protrudes may therefore be adjusted by screwing them in or out of the operating button 5. Referring again to Soffietti's figure on the folding insert at the back of this petition, it will be obvious that the lower tappet 6″ cannot be rotated for this purpose unless the upper tappet 6′ is first retracted so that it will not be in the way of the off-set portion of tappet 6″ when the latter is turned. In adjusting these tappets for a given station, the following procedure must therefore be followed: First, the upper tappet 6′ must be retracted. Second, the lower tappet 6″ must also be retracted. Third, the desired station must be tuned in by the manual knob (not shown), so that the rocker, colored green, will assume the corresponding angular position. Fourth, the lower tappet 6″ must then be screwed out so that when the off-set portion is down, as shown in the figure, the end of the tappet will just engage

the rocker. And fifth, the upper tappet 6′ must be screwed out until it also engages the rocker.

It will be obvious that this arrangement circumvents the difficulty encountered in the Marschalk tuner, because the rocker is contacted on both sides of its rotational axis by two different tappets, instead of by a single integral tappet that is freely pivoted during the adjusting process. But Soffietti's tuner is a tedious and difficult thing to adjust. Soffietti clearly did not find the problem as easy to solve as the appellate court supposed. But Soffietti was faced with the actual problem, not with its solution.

Finding 19 of the trial court was clearly supported by substantial evidence.

There is no record that it ever occurred to anyone other than Leishman, that creeping could be avoided without the introduction of extra parts merely by the shape and arrangement of the tappet and rocker. There is no record that anyone, other than Leishman, ever made a correct analysis of the causes of creeping. And there is no evidence that anyone, other than Leishman, ever used a coaxial relationship for the prevention of rotation, as the trial court found in Finding of Fact 14, quoted on page 3 hereof.

Other pertinent findings of the trial court were as follows:

> "21. In the summer of 1937, the radio industry was using to a great extent automatic tuners referred to as motor driven tuners and telephone dial tuners. These were so inaccurate mechanically that they required expensive automatic frequency control circuits to make them at all acceptable to the trade. . . ." [R. 31.]

* * * * * * * *

"25. Early in the year 1938 [when Leishman's patent issued], radio set manufacturers and radio parts manufacturers began to use radio tuners embodying the invention covered by claims 7, 8, 9, 10 and 11 of the reissue patent in suit. Tuners of this kind were supplied to the public in approximately 8,000,000 radio sets up to April, 1942. These tuners were sufficiently accurate mechanically to operate satisfactorily without the need of automatic frequency control circuits, and were easy to adjust to different broadcasting stations. The popularity of the motor driven and telephone dial tuners declined after 1938, and are now virtually obsolete." [R. 32.]

In two recent patent cases, some of the members of this Honorable Supreme Court held that the long failure of others to present a satisfactory solution to a problem, together with the immediate adoption and commercial success of the solution when it appeared, constitute evidence that such solution involved invention. The other members of the court held that this is not the case if the principle of the patentee's solution had previously been used for a similar purpose in an analogous art. In *Goodyear Tire & Rubber Co., Inc., v. Ray-O-Vac Co.,* 321 U. S. 275, the justices holding the latter view were in the minority. In *Jungersen v. Ostby and Barton Company et al.; Ostby and Barton Company et al. v. Jungersen; Jungersen v. Baden et al.,* 69 S. Ct. 269, the justices holding this view were in the majority. In the **instant** case there is **no record** of an **analogous** use of a coaxial relationship in **any** art at **any** time. The uncontroverted findings of the trial court on this point were as follows [R. 30]:

"13. The **coaxial** relationship between the axis of the tappet, or adjustable means, and the axis of

the rocker **is for the purpose of preventing any rotation whatever** of the adjusted tappet and rocker during the adjusting process. Coaxiality has been used **in the past** for the **opposite** purpose of **permitting parts to move freely** and without binding.

"14. The defendant presented no example of the use of a coaxial relationship that was at all analogous to the use made of this relationship in the combination set forth in the claims of the reissue patent in suit; and defendant's expert, Dr. Spotts, stated on cross-examination **that he knew of no instance in which a coaxial relationship had been used for a similar purpose.**" (Emphasis added.)

In the instant case we thus have a device that responds to the tests of invention prescribed by all the justices of this Honorable Supreme Court. It is therefore untenable that the claims should be held lacking in invention just because the Court of Appeals for the Tenth Circuit has concluded by inaccurate drawings and a pseudo-scientific analysis, having no basis in the record, that the reasons for creeping can be ferreted out in retrospect.

In the face of the trial court's findings of fact and the admission of Dr. Spotts, it is a gross violation of Rule 52(a) for the appellate court to reverse the lower court upon nothing more substantial than rash assumptions and the reviewing tribunal's inept mathematical analysis, which it has substituted for the evidence. Such an unwarranted departure from the accepted and usual course of judicial proceedings should neither be condoned nor tolerated, and this Honorable Supreme Court should accordingly exercise its supervisory powers as provided in Rule 38(5b).

8. Had the Appellate Court Not Improperly Reversed the Lower Court on the Issue of Validity, It Is Clear From Footnote 3 of the Appellate Court's First Opinion That It Would Have Held the Claims Infringed, Thus Creating Strong Grounds for a Review by This Honorable Supreme Court of a Ninth Circuit Opinion in Which the Tuners Here Accused Were Held Not to Infringe Because They Are Operated by Plungers Rather Than Levers.

The appellate court's improper action herein is all the more serious because it has repercussions in other cases. Had the appellate court not erroneously reversed the lower court on the issue of validity, it is clear from an examination of the citations in footnote 3 in the first and second decisions herein [R. 502], that the court would have affirmed the lower court in its holding of infringement. This would have created a clear and direct conflict with two decisions of the Court of Appeals for the Ninth Circuit, where the same tuners here accused were freed of the charge of infringement on the single ground that the operating plungers are not equivalents of the operating levers shown in the patent.[8] It thus appears that the action of the Court of Appeals for the Tenth Circuit in the instant case has had the additional effect of depriving petitioner of a review by this Honorable Supreme Court of the Ninth Circuit decisions on the ground of a conflict between Courts of Appeals for the Ninth and Tenth Circuits on the issue of infringement.

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[8]The most recent of these Ninth Circuit cases was *Leishman v. Radio Condenser Company et al.*, Supreme Court case No. 372, October term, 1948.

Conclusion.

It is respectfully submitted that the decision of the Court of Appeals for the Tenth Circuit herein is such a radical departure from establish judicial procedure and the requirements of Rule 52(a), F. R. C. P., as to call for a review by this Honorable Supreme Court under its Rule 38(5b).

JOHN FLAM,
Attorney for Petitioner.

Certificate.

This petition is in my judgment well founded, and is restricted to grounds specified by Rule 33(2), and is not interposed for purposes of delay.

JOHN FLAM,
Attorney for Petitioner.